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ABSTRACT

The National Council of Teachers of Mathematics Standard #2 (communicating aids students to clarify their thinking) emphasizes that reading, writing, discussing, representing, and listening to mathematics are important aspects of learning and using math. Six of the 12 math series chosen for California's elementary program list titles of children's trade books useful for supplementing lessons. A random selection of trade books listed in the 6 series was made to determine whether or not the book qualified as literature for classroom use. Among books listed in 2 or more of the adopted series are 10 popular children's books with math topics. A sample lesson plan integrating into the first-grade curriculum a recently published picture book ("One Hundred Hungry Ants" by E. Pinczes) listed in the "Houghton Mifflin Math" series could help students explore larger numbers, comparing numbers, and grouping. (A 16-item sampling of other math-related children's literature (organized by the topics of measurement, geometric shapes, fractions and decimals, and counting), and a list of 3 books for teachers are attached.) (RS)

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INCORPORATING LITERATURE IN THE PRIMARY GRADES TO PROMOTE MATHEMATICS AS COMMUNICATION: NCTM STANDARD #2

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According to Standard #2 of the thirteen standards developed for the elementary level by the National Council of Teachers of Mathematics(NCTM), communicating aids students to clarify their thinking. Math study should therefore include many opportunities for communication so that children can:

- Relate everyday language to mathematical symbols and language through such activities, for example, as cooking in the classroom.
- Reflect on and clarify their thinking about math ideas and situations through, for example, appropriate teacher questioning strategies.
- Relate pictures, diagrams, and physical materials to math ideas by, for example, using manipulatives frequently.
- Realize that reading, writing, discussing, representing, and listening to mathematics are important aspects of learning and using math by, for example, perusing and reading picture books.

Consequently, when California in October 1994 officially adopted 12 math series for its elementary program, it was significant that six of these listed titles of children's trade books useful for initiating, enriching, or supplementing lessons in such areas as fractions and decimals, numeration and number sense, whole number operations, whole number computation, geometry and spatial sense, measurement, etc. Those series are: Anytime Math(Harcourt Brace), Houghton Mifflin Math, Math Every Day(D.C. Heath), Mathland(Creative Publications),

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Quest 2000(Addison-Wesley), and Scholastic Math Place. A random selection of trade book titles listed in those six series was made in order to determine whether or not the book qualified as literature for classroom use during math instruction for the primary grades.

Five criteria were developed to ascertain any book's inclusion in the Mathematics as Communication standard. These were: (1) its relevance to the math concepts/topics; (2) the accessibility of needed teaching materials to fully implement the usefulness of the story/text; (3) its suitability for integrating across the curriculum; (4) its grade level appropriateness; and (5) the literary qualities of the prose. The last demanded consulting such reference sources as the fifth edition of Best Books for Children: Preschool Through Grade Six(R. R. Bowker, 1994), two recent California state frameworks(Literature for Science and Mathematics{K-12} and Read to Me-Recommended Literature for Children Ages Two Through Seven), The Wonderful World of Mathematics(NCTM, 1992), and The Horn Book Magazine.

Popular Books with Math Topics

Among books listed in two or more of the adopted series--with their corresponding math topics--are the following:

Anno's Counting Book: An Adventure in Imagination(M. Anno, 1977, Harper). SYNOPSIS: A wordless picture book that shows the numbers zero through 12 with double-page displays. Watercolor landscapes show the seasons of the year together with the activities of people and animals. TOPICS: Counting, One-to-One Correspondence, Number Recognition.

Caps For Sale(E. Slobodkina, 1947, Harper). SYNOPSIS: The tired cap peddler falls asleep under a tree filled with monkeys. They take his caps but the angry peddler uses his imagination to retrieve his goods. TOPICS: Combining and Separating.

A Chair For My Mother(V. Williams, 1982, Greenwillow). SYNOPSIS: Rosa and her mother save their coins until they have enough money to replace the big, comfortable chair destroyed during a fire. TOPICS: Decimals, Estimation, Money.

The Doorbell Rang(P. Hutchins, 1986, Greenwillow). SYNOPSIS: Every time the doorbell rings, it means more visitors. Since there are only a dozen cookies for the children to share, Victoria and Sam become concerned until Grandma arrives with a new package--of cookies. TOPICS: Fractions, Whole Number Operations.

Eating Fractions(B. McMillan, 1991, Scholastic). SYNOPSIS: A multicultural book in which full-color photographs show two children as they divide food into halves, thirds and fourths. They then proceed to eat the bananas, cloverleaf rolls, strawberry pie, etc. TOPICS: Fractions, Number Concepts.

The Grouchy Ladybug(E. Carle, 1977, Harper). SYNOPSIS: An aggressive ladybug challenges all the animals he meets, regardless of their size. The brilliantly illustrated pages vary in size with those of the animals. TOPICS: Measurement, Sequencing.

How Big Is a Foot? (R. Myllar, 1991, Dell). SYNOPSIS: The king decides to surprise his wife on her birthday by having a bed made especially for her(in the days when there were no beds). However, the apprentice carpenter makes a bed which is too small for the queen and is jailed until he resolves the problem. TOPICS: Measurement (Nonstandard vs. Standard).

Moja Means One: A Swahili Counting Book(M. Feelings, 1971, Dial). SYNOPSIS: Memorable illustrations in soft gray charcoal introduce the reader to a unique East African people and their area. Swahili names for the numbers through ten are presented. TOPICS: Counting, Number Sense.

The Three Bears(P. Galdone, 1979, Houghton). SYNOPSIS: Three different-sized bears live as a family in a home in the woods. When they go out for a walk one day, little Goldilocks enters the cottage and tries out three different-sized bowls, chairs, beds, etc. When the bears return, Goldilocks becomes frightened and runs away. TOPICS: Number Sense and Numeration.

The Three Billy Goats Gruff(Galdone, 1973, Houghton). SYNOPSIS: A nasty troll meets his match after encountering three different-sized billy goats trying to cross his bridge. TOPIC: Number Sense.

Lesson Plan

A lesson plan integrating into the first grade curriculum a recently(1993) published picture book (One Hundred Hungry Ants by E. Pinczes) listed in Houghton Mifflin Math could proceed thus:

Objective: Exploring Larger Numbers, Comparing Numbers, Grouping.

Materials: Small picnic tablecloth, several paper plates, holed-edge strips from recycled continuous-feed computer paper. Cut computer paper strips as follows: 1 strip of 100 holes, 2 strips of 50 holes, 4 strips of 25 holes, 5 strips of 20 holes, and 10 strips of 10 holes. One copy of One Hundred Hungry Ants.

Procedure: 1. Have class recall experiences with picnics and ants.
2. Read the story aloud.
3. Spread out the tablecloth and the plates.
4. Reread the story as you demonstrate the various-sized lines of ants with the paper strips.

Activities: 1. Have pairs of children make their own lines with the computer paper. Show them how to label strips five holes at a time with a pencil to help them keep track of their counting; e.g., 1, 5, 10, 15, 20, etc. Line strips up on the floor or a table to retell the story.

2. Use tally marks to represent the ant groups on a large sheet of paper. Label groups with numerals(100 ants) and words(one hundred ants).
3. Have pairs of children use unifix cubes to discover other ways of grouping 100 ants. If necessary, prompt the students by asking, "If you put five ants in a line, how many lines would you have?".

A Sampling of Other Math-Related Children's Literature by Topics for the Primary Grades

Measurement:

Barry, D. (1994). The Rajah's Rice: A Mathematical Folktale from India. W. H. Freeman.

A young girl named Chandra cures the Rajah's sick elephants. and earns the right to claim the reward of her choice. Cleverly she chooses a reward that multiplies.

Birch, D. (1988). The King's Chessboard. Penguin.

A wise man outsmarts a vain king when he is offered a reward.

Lionni, L. (1962). Inch by Inch. Astor-Honor.

When the birds demand that he measure the length of a nightingale's song, this clever, captive inchworm is able to inch his way to freedom.

Pittman, H. (1986). A Grain of Rice. Hastings House.

Set in 15th century China, the story concerns a poor farmer who asks for the hand of the emperor's daughter in marriage.

Geometric Shapes:

Ehlert, L. (1989). ColorZoo. Harper.

It shows how basic shapes can be combined to make familiar objects.

Feldman, J.(1991). Shapes in Nature. Children's Press.

Using photographs of animals and birds, different shapes (such as the circle) are illustrated.

Reiss, J.(1982). Shapes. Macmillan.

The oval, circle, triangle, rectangle, and square are presented to young children in vivid primary colors.

Rogers, P. (1990). The Shapes Game. Henry Holt.

All kinds of shapes are introduced with rhymes.

Fractions and Decimals:

Hoban, L. (1981). Arthur's Funny Money. Harper.

Arthur, a chimp, wants to buy a T-shirt and matching cap so he sets up a bicycle-washing business with his little sister Violet.

McNamara, L. (1972). Henry's Pennies. Franklin Watts.

Henry is a boy who likes to collect pennies. One day he decides to attend a white elephant sale and use his pennies to buy a new pet. He manages to buy a very special pet!.

Maestro, B. & Maestro, G. (1988). Dollars and Cents for Harriet. Crown

Harriet the elephant finds a toy she wants for $5.00. Since she only has 100 pennies, she earns the rest of the money in different denominations of coins.

Mathews, L. (1979). Gator Pie. Dodd, Mead.

Two alligators find a pie near the edge of the swamp. They wish to divide it into halves but more alligators keep coming to demand a slice and begin to fight among themselves. So Alice and Alvin(who found the pie) whisk it away to split it evenly between them because it is chocolate marshmallow--their favorite kind.

Counting:

Aylesworth, J. (1988). One Crow: A Counting Rhyme. Harper.

Summer and winter on the farm features barnyard animals in sets from zero through ten with corresponding numerals. Each easy-to-count set of animals is introduced through rhyming verse.

Ehlert, L. (1990). Fish Eyes: A Book You Can Count On. Harcourt.
Against the blue background of the ocean is outlined one black fish. The reader is encouraged to include that fish in the total count of sets from one green fish to ten darting fish; e.g., "5 spotted fish plus me(the black fish) makes 6". This is a book of compelling color and design.

Rees, M. (1988). Ten in a Bed. Little, Brown.
The opening page shows ten little children crowded in one bed, and then the traditional rhyme starts. One by one they fall out of bed, and become involved in different household activities. The book introduces beginning addition and subtraction.

Tafuri, N. Who's Counting? (1986).
Puppy starts to explore the environment and finds "1 squirrel, 2 birds, ...and 10 puppies".The final page shows the 10 puppies with 10 food dishes labeled with the numerals 1 to 10. Each double page spread is devoted to one numeral only.

Books for Teachers(1993-1995)

Braddon, K. Hall, N. & Taylor, D. (1993). Math Through Children's Literature: Making the NCTM Standards Come Alive. Englewood, CO: Libraries Unlimited.

Sheffield, S. (1994). Math and Literature(K-3), Book Two. Portsmouth, NH: Heinemann.

Whiten, D. & Wilde, S. (1995). It's the Story That Counts. Portsmouth, NH: Heinemann.

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